Standard Operating Procedure for GLNPO Specific Conductance: Conductivity Bridge

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1.0 Scope and Application

1.1 This method is applicable to drinking and surface waters.

1.2 The approximate working range is 10 to 500 mhos/cm.

2.0 Summary of Method

2.1 The specific conductance of a sample is measured using a self-contained conductivity meter, Wheatstone Bridge type, or equivalent.

2.2 The conductivity is measured at 25°C.

3.0 Sample Handling and Preservation

3.1 Samples are collected in clean glass or plastic containers.

3.2 Samples are stored at 4°C. They are considered stable for 28 days.

3.3 When placing a beaker of standard or sample on the apparatus, care must be taken to assure that no air bubbles are trapped inside the electrode.

3.4 The apparatus must be rinsed once with a portion of the solution (sample or standard) before taking a reading or calibrating the meter.

4.0 Interferences

4.1 Oil, grease, algae, or dirt can interfere by coating the electrodes, causing sluggish response and incorrect readings.

4.2 Sample temperatures other than 25°C will cause incorrect results.

5.0 Apparatus

5.1 Conductivity Meter, Wheatstone Bridge type or equivalent, with nominal 1 cm cell constant. (YSI Model 35 with YSI probe 3403).

5.2 Variable speed stirring motor with glass stirring paddle.

5.3 Immersion heater with controller.

6.0 Reagents

6.1 Reagent water: All reagents are prepared using reagent water that has passed through at least two ion exchange cartridges. The specific conductance of the reagent water used for standard preparation must be less than 1 µmho/cm.

6.2 Stock sodium chloride set standard solution. Dissolve 10.000 gm of dried NaCl in reagent water and dilute to 1 L in a volumetric flask.

6.3 Working Calibration Standards

The following may be prepared with volumetric labware.

mL of 10 gm/L NaCl diluted to 1 L	Specific Conductance µmhos/cm
20	415.8
15	313.5
10	210.3
5	106.1

6.4 Stock Control Standard Solution: Any salt solution with known specific conductance may be used to prepare control standards. However it should be prepared entirely independently by someone other than the analyst. The following is acceptable.

Dissolve 10.000 gm of dried KCl (105°C for two hours) in reagent water and dilute to 1 L in a volumetric flask.

6.5 Control Standards: The following may be prepared using volumetric labware.

	mL 10.00 g/L KCl diluted to 1 L	Specific Conductance µmhos/cm at 25°C
Hi Control	15	293.3
Lo Control	10	196.5

7.0 Instrument Calibration - YSI Model 35

7.1 The calibration procedure involves correlating the instrument reading to the known concentration of the calibration standards and results in determining the cell constant correction.

7.2 Pour a used portion of 313.5 µmho/cm NaCl standard into an appropriate receptacle and place this on the apparatus. Turn on the stirrer to rinse the various components and then discard the solution.

7.3 Pour a fresh portion of 313.5 µmho/cm NaCl standard into the same receptacle and place on the apparatus. Turn on the stirrer and the heater and adjust the temperature to 25.0°C. Adjust the umho calibration potentiometer so that the reading coincides with the true value. Check to be sure the temperature is still 25.0°C. Save this solution for rinse for the next standardization.

7.4 Similarly, check the other set standards and a blank (Reagent Water) to verify proper operation over the entire range (Do not readjust the umho calibration potentiometer).

8.0 Analytical Procedure

8.1 Rinse the apparatus with sample by filling the receptacle and putting it in place on the apparatus. Discard this rinse and then fill the receptacle with sample and place it on the apparatus such that there are no air bubbles inside the conductivity cell. For samples from the same station with about the same conductivity, it is not necessary to rinse between samples.

8.2 Adjust the temperature to 25.0°C, and record the reading from the conductivity meter.

8.3 When the apparatus is not being used, the conductivity cell should be immersed in reagent water. For extended periods of non-use, the cell may be thoroughly rinsed with reagent water and left to dry. Before re-use, it must be soaked overnight in one of the standards.

9.0 Calculations

The specific conductance is determined directly from the proper meter readings and the range indication, e.g.,:

Meter Reading X Range µmho/cm	Specific Conductance
6.20 X 100	620
0.62 X 1	0.62

10.0 Quality Control

10.1 GLNPO Specific Conductance

The two control standards described above are run once every 12 hour shift, or once every two stations, whichever is less. Reagent blanks (reagent water processed through the sample storage container) are run approximately once in every four stations.

11.0 Preventive Maintenance

This is described in the system log book.

12.0 Troubleshooting/Corrective Action

12.1 Non linear response may be caused by a non-conditioned cell, a dirty cell, inadequate care in preparation of standards, inadequate attention to precluding bubbles from the cell during standardization, a defective cell, inadequately precise control of temperature, or inadequate rinsing of the apparatus between standards.

12.2 If the cell is so dirty that bubbles always form at the top of the cell when a receptacle of water is placed on the apparatus, ethanol or 1 N NaOH may be used to attempt cleaning. Neither should be left on the cell for more than two or three minutes.

13.0 References

13.1 "Methods for Chemical Analysis of Water and Wastes"; March, 1979. EPA Publication #600/4-79-02.

13.2 "Operating Instructions, YSI Model 35 Conductivity Meter.

13.3 "Calibration of Conductance Cells at 25°C with Aqueous Solutions of Potassium Chloride"; April 1959. Journal of the American Chemical Society. 1557-1559